IOWA HIGHWAY RESEARCH BOARD (IHRB)

Minutes of February 26, 2016

Regular Board Members Present

A. Abu-Hawash	K. Mayberry
K. Jones	L. Roehl
T. Nicholson	M. Parizek
S. Okerlund	T. Wipf
R. Knoche	
R. Stutt	

Alternate Board Members Present

C. Poole
L. Bjerke
P. Mouw

Members with No Representation

P. Hanley
W. Weiss
T. Wipf

Secretary – V. Goetz

Visitors

Leighton Christiansen	Iowa Department of Transportation
Akiema Buchanan	Iowa Department of Transportation
Brian Worrel	Iowa Department of Transportation
Francis Todey	Iowa Department of Transportation
Dean Bierwagen	Iowa Department of Transportation
Eli Ramirez	Iowa Department of Transportation
Mike Nop	Iowa Department of Transportation
Ping Lu	Iowa Department of Transportation
Mike Kennerly	Iowa Department of Transportation
Wayne Sunday	Visitor – Retired DOT
Brent Phares	InTrans, Iowa State University
J. Scott Ingersoll	FOTH IE
Jacob Thorius	Washington County
Lisa McDaniel	FHWA
Todd Kinney	Clinton County
Dan King	ICPA

The meeting was held at the Iowa Department of Transportation Ames Complex, Materials East/West Conference Room, on Friday, February 26, 2016. The meeting was called to order at 9:00 a.m. by Chairperson Terry Wipf with an initial number of 13 voting members/alternates at the table.

1. **Agenda review/modification**

2. **Motion to approve Minutes from the September 25, 2015 meeting**

Motion to Approve by C. Poole; 2nd R. Knoche
Motion carried with 15 Aye, 0 Nay, 0 Abstaining.

3. **Final Report:** TR-654**,** "Development of a Subgrade Drainage Model for Unpaved Roads", Thanos Papanicolau, University of Iowa.

BACKGROUND

The basic design for gravel roads in Iowa was used to focus our efforts to the most problematic areas regarding drainage. Typically in Iowa, the construction of gravel roads follows the Statewide Urban Design and Specifications, or SUDAS (Wiegand and Stevens, 2007). In general, gravel roads follow the basic pattern seen in Figure 4. The gravel surface layer covers an aggregate subbase, which sits on top of the subgrade soils. Most attention has focused on the gravel surface layer as the primary spot of failure (e.g., Skorseth and Selim, 2000). Failure of the surface gravel under heavy loads can result from marginal gravel depths or the use of substandard material. Reports like those of Skorseth and Selim (2000) detail the calculations for determining the required surface layer depths for the different regions across the US, considering the local climate and expected loads.

Additionally, the composition of the surface gravel is important. Good surface gravel must contain a mixture of stone, sand, and fine soils. Proper blends of these material sizes will ensure that a road performs well with adequate load-bearing strength, drainability, and cohesion to keep the materials together. For example, high amounts of coarse material (i.e., gravel and sand) may increase the load-bearing strength and drainability of the roadway, but the aggregate mixture will have little cohesion to hold it all together. As a result, the roadway will remain loose and unstable on a gravel road (Skorseth and Selim, 2000). In Iowa, that proper mixture is 40-80% hard stone with diameters uniformly graded from ¼ to 3 inches; 20-60% sand smaller than ¼ of an inch; and 8-15% fines (IDOT, 2011). One striking observation with these standards is the wide range for each size class. This wide range allows for flexibility to accommodate the natural variability in climate and local soil conditions seen in Iowa.

OBJECTIVES

The primary objective of this project was to provide a physically based model for evaluating the drainability of potential subbase and subgrade materials for gravel roads in Iowa. The offered model works under saturated and unsaturated conditions and for a wide range of key design hydraulic and geotechnical parameters seen throughout the state. This model was used to identify those key parameters that contribute to poor subgrade drainage performance and the formation of boils in the gravel roads of Iowa.

Using this information of the key parameters from the model, we identified problematic areas in the state of Iowa by examining soil maps from the Natural Resources Conservation Service (NRCS). These maps provide the necessary information regarding the local site conditions and typically reflect the subgrade materials.

Finally using the model and the knowledge gained from examining the soils maps, we proposed alternative roadway design compositions for the subbase and subgrade layers to improve their drain ability.

Implementation

This has been implemented in an Iowa County in an adjacent location; we have seen a significant change in the hydraulic conductivity. It use to take 6 hours to drain this study, the hydraulic activity took 2.4 hours to drain.

Motion to Not-Approve by R. Knoche; 2nd P. Mouw
Motion carried with 15 Aye, 0 Nay, 0 Abstaining.

4. **FINAL REPORT: TR-675,** *"Comparison of Setting Time Measured Using Ultrasonic Wave Propagation with Saw-Cutting Times on Pavements", **Peter Taylor,*** **Iowa State University.**

BACKGROUND

To conduct pavement finishing effectively and schedule saw-cutting at joints accurately, contractors need to know when the sawing window will open. If the cuts are made too early, there is a risk of raveling, but if the cuts are made too late, there is a risk of random cracking. Commonly used methods to determine sawing time include scratching the surface with a penknife or standing on the slab and observing the footprint depth. However, these methods are subjective, and the results are open to dispute. In addition, different aggregate types, sawing machines, ambient temperatures, and wind speeds make it difficult for contractors to determine saw-cutting times using these methods. One approach to more reliably predicting saw-cutting time is to monitor temperature rise using a semi-adiabatic calorimeter. However, concerns have been raised that temperature is not uniquely tied to setting, and that tests conducted using a semi-adiabatic calorimeter may not represent the environment to which a given slab is exposed. A pilot project conducted by the research team indicated that the ultrasonic pulse velocity (UPV) method has the potential to predict the saw-cutting window for early entry sawing. This method is based on the principle that the velocity of an impulse through a concrete sample begins to increase when hydration products start to interact, i.e., when initial set occurs. In the pilot project, however, all field work was conducted with early entry saws and all sites used similar mixtures, most of which contained limestone aggregate. Therefore, there was a need to widen the range of the data to include different mixtures, aggregate types, and sawing methods. There was also a need to assess the viability of using thermal-based approaches, including i-buttons placed in the slab or calorimeters.

OBJECTIVES

The objective of this research was to evaluate the effectiveness of the UPV method along with thermal-based systems to predict sawing time by measuring the initial set of a mixture in situ.

DISCUSSION

Q. You mentioned one of the City projects you had cracking, did you see any cracking or raveling on any of the other projects?
A. We did not see any raveling, we did see some cracking on one of the other sights, more related to a foundation issue, rather than the saw cutting.

Motion to Approve by D. Schnoebelen; 2nd T. Nicholson
Motion carried with 15 Aye, 0 Nay, 0 Abstaining.

5. **FINAL REPORT: TR-650**, "Development of Non-Petroleum Based Binders for Use in Flexible Pavements – Phase 2", Chris Williams, Iowa State University

BACKGROUND

The substantial increase in oil prices over the past few years has been reflected in asphalt prices. Moreover, the maximization of fuel production in refineries has reduced asphalt supply. These conditions have prompted the development of alternative sources of asphalt binders, including bio-oils derived from the fractionated fast pyrolysis of biomass that comes from agricultural and forestry residues, e.g., oakwood, switchgrass, and cornstover.

OBJECTIVES

The project objectives were to improve the low-temperature performance of bio-binders by developing asphalt-rubber mixtures made from ground tire rubber and an optimized binder (using petroleum asphalt, bio-oils from fast pyrolysis of biomass, or both in combination) in order to improve performance throughout the life of the pavement and provide greater stability during the production and construction stages. These objectives were achieved by developing and evaluating the performance of laboratory mixes with the modified bio-binders.

Implementation

The license will be given back to us in a few weeks, at that time I will develop a plan to do some pilot projects.

Motion to Approve by K. Jones; 2nd D. Miller
Motion carried with 15 Aye, 0 Nay, 0 Abstaining.

6. **FINAL REPORT: TR-651**, *"Iowa Pavement Asset Management Decision-Making Framework*", David Jeong, Iowa State University

BACKGROUND

Most local agency staff in Iowa currently makes their pavement treatment decisions based on their experience and judgment due primarily to lack of a systematic decision-making framework and a decision-aid tool. Local agencies need a systematic pavement treatment selection framework to justify and easily defend maintenance and rehabilitation decisions and to achieve the highest return value on their pavement investment. Maintenance and rehabilitation decisions can be technically justified by incorporating pavement condition data into the decision-making framework. The highest return-on-investment (ROI) value can be determined by analyzing the economic values of technically feasible treatments.

This study first conducted a comprehensive literature review and documented various treatment methods available in the industry and their technical application boundaries, treatment costs, and expected life expectancies. In addition, pavement maintenance and rehabilitation selection practices were documented as part of the literature review. A statewide survey questionnaire was also sent out to determine common local pavement distress types, common treatment methods used by local agencies, and decision-making processes in selecting pavement treatments used by local agencies. In addition, follow-up phone calls and interviews were conducted. The findings from the literature review and the survey and interviews were incorporated into development of a pavement treatment selection framework for local agencies.

OBJECTIVES

This project had five objectives to accomplish the final goal of developing a pavement asset management framework for selecting a pavement treatment through evaluating benefits of various treatment options from do nothing to full replacement:

- Develop a framework for selecting feasible treatment options when the conditions of a pavement section are given
- Develop a methodology in assessing ROI values of various treatment options available for Iowa pavements
- Develop a spreadsheet-based decision-aid tool that can be used by local agencies in selecting the most appropriate treatment option
- Conduct case studies using the tool developed in this project and validate the tool
- Train local agency engineers for rapid dissemination of the tool

DISCUSSION

Q. The Life expectancy with the different treatments, did you check with any other States or any of Iowa's Data or pavement management system to arrive at any of the life expectancies?
A. In terms of the unique cost of the different types of treatments and life expectancy of each treatment, we have developed with other State agencies, how to improve their practices. We were able to get the life expectancy from other State agencies data. We conducted a survey with our local states that showed the life expectancies for each treatment.

Suggestion to remove the Cold in place life expectancy from the table, the count is too low.

Motion to Approve by R. Knoche; 2nd S. Okerland
Motion carried with 15 Aye, 0 Nay, 0 Abstaining.

***** 1 member left the table. Total voting members = 14.**

7. **RFP proposal: IHRB – 14-10:** *"Prevention of Longitudinal Cracking in Iowa Widened Concrete Pavement",* Halil Ceylan, Iowa State University

BACKGROUND
It is well known that concrete slabs tend to crack when the tensile stresses, which can vary considerably during the early ages, exceed the slab tensile strength. Transverse and longitudinal saw cuts are typically created at locations where a crack is intended to initiate and propagate downward in an attempt to minimize the induced stresses and to induce a plane of weakness. However, it has been observed in the field, that cracks don't appear at the saw cut locations, but at unexpected locations, resulting in random cracking, especially during the early age of concrete.
In Iowa, field observations made by Iowa DOT's PCC Materials Engineer, Todd Hanson, and the ISU research team (while on road conducting another study) indicate that random longitudinal cracks in Iowa widened JPCPs typically start as 4- to 6-inch long cracks from the joint, but eventually grows in degree and severity.

A number of studies, dating as back as 1935 (Janda 1935) have been conducted by different State Highway Agencies (SHAs) in the US to examine the causative factors for the occurrence of longitudinal cracking in JPCP as well as preventive strategies to mitigate them. A general observation emerging from the existing literature on JPCP longitudinal cracking is that it is a result of several interrelated factors, including variations in temperature, moisture gradients between slab top and bottom, jointing practices, and the type of base/subbase material. Jointing practices include saw cut characteristics (timing, sawing process, saw cut depth, etc.), joint spacing, and alignment of dowel at the joint.

OBJECTIVES
The primary objectives of this research are to identify the causes of longitudinal cracking in Iowa widened JPCP and to develop recommendations for widened JPCP design features and construction practices to prevent and minimize longitudinal cracking.
Such important outcomes will enable not only IA DOT but also County and City engineers to have justification for achieving long-lasting concrete pavement in Iowa.

Motion to Approve by R. Knoche; 2nd K. Jones
Motion carried with 14 Aye, 0 Nay, 0 Abstaining.

***** 1 member left the table. Total voting members = 13.**

8. **Proposal: HR-296,** *"Iowa Local Technical Assistance Program",* Keith Knapp, Iowa State University

BACKGROUND
Part of the national vision for all LTAPs is to "…improve the quality and safety of the surface transportation system through interactive relationships and information exchange." The activities and initiatives completed by the Iowa LTAP that help it to achieve this goal are defined in this report. Five subject-based focus areas (described later in this document) that have been identified by the FHWA are used to categorize these activities and initiatives.

The following mission statement for the Iowa LTAP was developed by its advisory board. It describes why LTAP is important to local agencies in Iowa and why the continuation of the program is desirable: The Iowa Local Technical Assistance Program's mission is to foster a safe, efficient, and environmentally sound transportation system by improving the skills and knowledge of local transportation providers through training, technical assistance, and technology transfer. By working together, we strive to enhance the quality of life for all Iowans.

OBJECTIVES

The primary objective of Iowa LTAP is to provide quality training events and technical transportation-related information that is useful to local transportation agencies. These activities need to be completed, within current LTAP funding, in a manner that is effective and efficient. Desirably, these activities are also provided when they are most needed by local transportation agencies and in a format that is useful and useable. New knowledge and tools, developed through IHRB research or other entities (e.g., the Institute for Transportation (InTrans)), are incorporated, as appropriate, into either existing or new LTAP activities.

The strategic planning and decision-making needed to make Iowa LTAP a premier technology transfer resource is guided by the following principles:

- Define and respond to customer needs;
- Provide quality customer service through various methods;
- Evaluate effort and track performance to improve service and communicate impacts;
- Apply fiscal responsibility through the selection of economically feasible and sustainable activities/tasks;
- Strive for predictable program funding and continue with highly capable staff;
- Expand and strengthen state and national organizational partnerships that may enhance Services

DISCUSSION

Q. With the increase in funding, do we anticipate any changes in the future? Is this going to be a transitional funding?
A. I am always looking for alternative funding; this is potentially funding 40% of my salary.

Motion to Approve by W. Weiss; 2nd R. Fangmenn
Motion carried with 13 Aye, 0 Nay, 0 Abstaining.

9. **Proposal: TR-652 Revision,** *"Analysis of Statewide Pavement Marking Program",* Neal Hawkins, Iowa State University

BACKGROUND

Pavement markings play a critical role in guiding motorists through delineating the roadways for safe and efficient travel. This project will provide support to the Iowa DOT Office of Maintenance and the DOT Pavement Marking Task Force, in consideration of the primary decisions faced by the agency towards delivering appropriate pavement marking performance statewide. The work identified within this proposal will support advances in decision making capabilities in light of ever more challenging financial conditions and performance constraints.

OBJECTIVES

This work will support the Iowa DOT in developing a revised approach to statewide pavement marking management which considers cost constraints, performance and effectiveness, integration, and coverage. This will include addressing the following priority areas:

- Delivery methods and quality assurance
- Equipment
- Optimization, Coverage, and Levels of Service
- Data Collection and Evaluation
- Research needs
- Training needs

Motion to Approve by R. Knoche; 2nd K. Jones
Motion carried with 13 Aye, 0 Nay, 0 Abstaining.

10. Presentation HR-3001: *"Quantifying Road Roughness from Terrestrial Laser Scanning",* David Hawkins, Iowa State University

DISCUSSION

Q. What is the cost of this laser equipment?
A. The laser equipment is around one hundred thousand dollars.

11. Secondary Road Research Engineer Funding

Motion to Approve by R. Fangmann; 2nd K. Mayberry
Motion carried with 13 Aye, 0 Nay, 0 Abstaining.

12. New Business

The secondary research Engineer has been housed and will be paid out of the secondary road research fund. The DOT is no longer able to provide this position; the County engineers still feel a need for this position. We have approached the service bureau to provide this position.

Doug Schnoebelen has taken a leadership position with the U. S. Geological Survey in San Antonio Texas.

Ron, Kevin and Ahmads terms are due this year and have been elected to stay for another term.

Robs last meeting with the board is December 10, 2015. Myron from Benton County will be the new member and Todd from Clinton County will be the new alternate.

Patrick will be the alternative for the next two years. Paul will come back to finish his year then Patrick will finish his last year.

13. Adjourn

The next meeting of the Iowa Highway Research Board will be held Thursday December 10, 2015, in the East/West Materials Conference Room at the Iowa DOT. The meeting will begin promptly at 1 p.m.

Vanessa Goetz, IHRB Secretary